

Bringing Breast Cancer Technologies to Market

CCR research is recognized in novel competition to encourage the commercialization of breast cancer inventions.

Start-up companies are instrumental in bringing the fruits of scientific research to market. Recognizing an opportunity to bring entrepreneurial minds to bear on the diagnosis and treatment of breast cancer, the Avon Foundation for Women partnered with NCI and the Center for Advancing Innovation to launch the Breast Cancer Startup Challenge. The Challenge has brought together teams of university students and entrepreneurs to create strategic business plans to develop and commercialize patented technologies. Nine of the 10 inventions chosen

in the competition were developed by scientists at NCI: five by CCR scientists and two by scientists formerly with CCR.

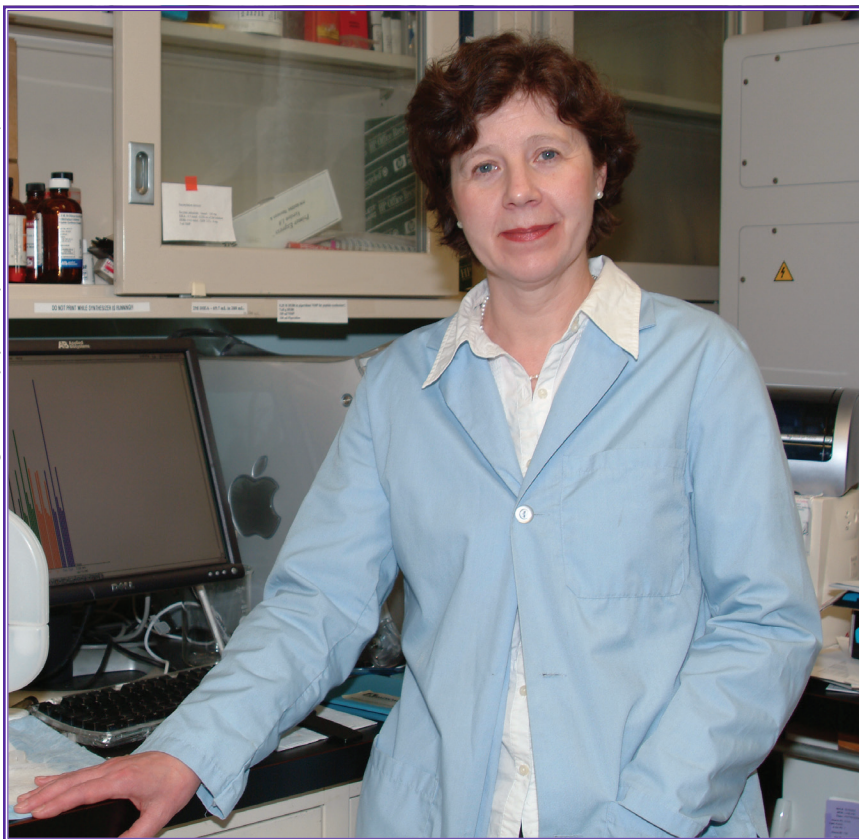
"NCI has always had a strong interest in fostering young investigators and the fact that this challenge pairs each student team with entrepreneur-mentors to assist in the development of the business plans is another example of how we can bring new ideas and energy to cancer research," said Douglas Lowy, M.D., Deputy Director of NCI and Chief of CCR's Laboratory of Cellular Oncology.

The chosen technologies include cancer diagnostics, therapeutics, prognostics, one medical device, one vaccine, one delivery system, and one health IT system. The 10 winning teams will each be encouraged to launch start-up companies to develop the technologies.

One of the winning teams, based at Rutgers University in N.J., has formed a company called OncoLinX to push forward research into a class of cytotoxins that boost the effectiveness of antitumor agents. Developed by Nadya Tarasova, Ph.D., Head of the Synthetic Biologics and Drug Discovery Facility in CCR's Cancer and Inflammation Program, the cytotoxins are easy to synthesize, stable in circulation, and are cell permeable. In an unpublished study, Tarasova and her colleagues discovered that when one of the cytotoxins was conjugated to the antibody Herceptin, the combined therapy killed 98 percent of cancer cells *in vitro* compared to 46 percent of cells killed by the antibody alone. An important step for the Rutgers team will be demonstrating the cytotoxins' safety and effectiveness in preclinical studies. Key to this will be developing a method for transporting the cytotoxin directly to diseased cells within patients' bodies, while avoiding surrounding healthy cells.

For any given cancer type, a number of treatment options exist. A major challenge for clinicians is determining which option is best for their patient without having to test them one by one. To address

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CCR researcher and Breast Cancer Startup Challenge inventor Nadya Tarasova, Ph.D.

this issue, Stephen Hewitt, M.D., Ph.D., Staff Clinician in CCR's Laboratory of Pathology, devised a tissue assay for up to four protein biomarkers. The presence or absence of the various biomarkers can indicate the optimal therapy for a patient and predict that patient's survival rate for a given treatment. "The invention came out of a single study where we measured multiple biomarkers looking for a correlation between biomarker and drug response," said Hewitt. "None of the biomarkers alone predicted response, but in ratios, based on the pathway interactions, they did." A team of students at McGill University in Montreal has formed a company called ProVivoX that plans to develop a test based on Hewitt's biomarker research that can predict breast cancer relapse. The team hopes to begin clinical trials by 2015.

Another particularly promising cancer therapy invented at CCR helps patients' immune systems target tumors more effectively. Dennis Klinman, M.D., Ph.D., Senior Investigator in CCR's Laboratory of Experimental Immunology, discovered a method for customizing synthetic immune system stimulators called CpG oligonucleotides that interact with immune cells that express Toll-like receptor 9 and thus drive an innate immune response. When linked to an apoptotic tumor cell vaccine derived from the patients' own tumor biopsies, the oligonucleotide-vaccine conjugates reduce tumor size, as well as prevent cancer recurrence and metastasis in mice. A team from Washington University in St. Louis, Mo., plans to apply CpG oligonucleotides to triple-negative breast cancer. They also hope to expand their treatment, which is dubbed TheraProVax, to other cancer types.

As for Klinman, he appreciates the chance to see his research, as well as that of his colleagues, brought out of the lab and into the hands of doctors. "The Breast Cancer Startup Challenge provides a wonderful opportunity to focus on inventions for the treatment of cancer and

improves the likelihood that they will find clinical application," he said.

To learn more about the Challenge, please visit <http://www.breastcancerstartupchallenge.com>.

CCR Inventions and Business Plan Winners*

Diagnostic from Biopsies with Software Analysis

Category: Diagnostics/Health IT

Lead Inventor: Tom Misteli, Ph.D., CCR

Winner: University of Cambridge

Immunotherapy Using Modified Self Tumor Cells

Category: Therapeutic

Lead Inventor: Dennis Klinman, M.D., Ph.D., CCR

Winner: Washington University in Saint Louis

Human Monoclonal Antibody-Based Cancer Therapies

Category: Therapeutic, Diagnostic

Lead Inventor: Mitchell Ho, Ph.D., CCR

Winner: Stanford University

Immunotherapy Using Granulysin Activated Monocytes

Category: Therapeutic

Lead Inventor: Alan Krensky, M.D., Northwestern University
(formerly with CCR)

Winner: Northwestern University

Anticancer Toxin

Category: Therapeutic

Lead Inventor: Nadya Tarasova, Ph.D., CCR

Winner: Rutgers, The State University of New Jersey

Genomic-Based Diagnostic Assay

Category: Diagnostics and Prognostic

Lead Inventor: Steven Libutti, M.D., Albert Einstein College of Medicine (formerly with CCR)

Winner: University of California, Berkeley

Tissue-Based Diagnostic Assay

Category: Diagnostic

Lead Inventor: Stephen Hewitt, M.D., Ph.D., CCR

Winner: McGill University

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